WHAT IS CLAIMED IS:

1. A device which is implantable in a blood vessel to block the flow of blood in at least one direction through that blood vessel, said device comprising:

a) a blood vessel engaging portion which is initially disposable in a radially collapsed configuration such that said device may be passed into the lumen of the tapered segment of said blood vessel, and subsequently expandable to an operative configuration wherein it will frictionally engage the surrounding blood vessel wall to hold the device in fixed position within said blood vessel lumen; and,

b) a lumen blocking portion which is affixed to said engaging portion, said lumen blocking portion being configured such that, when said engaging portion is in its operative configuration and in contact with the blood vessel wall, said lumen blocking portion will block the flow of blood in at least one direction through said lumen.

2. The device of Claim 1 wherein said blood vessel engaging portion is a wire frame.

3. The device of Claim 1 wherein said blood vessel engaging portion is an inflatable member.

4. The device of Claim 1 wherein said blood vessel engaging portion has projections which embed in the wall of the blood vessel.

5. The device of Claim 1 wherein said blood vessel engaging portion has hooks which embed in the blood vessel.

6. The device of Claim 1 wherein the blood vessel engaging portion comprises an adhesive which adheres to the blood vessel wall.

7. The device of Claim 1 wherein the blood vessel engaging portion comprises a plurality of members which are connected at a central location, and which emanate outwardly from said central location such that, when said

engaging portion is in its operative configuration, said elongate members will exert radial outward pressure against the blood vessel wall, said central location being further located and configured such that, when the device is implanted in a blood vessel, hemodynamic pressure against said central location will cause said elongate members to exert greater pressure against the blood vessel wall.

8. The device of Claim 1 wherein lumen blocking portion comprises a membrane.

9. The device of Claim 8 wherein said membrane is an elastomeric membrane.

10. The device of Claim 8 wherein one side of said membrane is formed of a first material which is resistant to cellular ingrowth, and the other side of said membrane is formed of a second material which is susceptible to cellular ingrowth.

11. The device of Claim 1 wherein said lumen blocking portion is a sponge.

12. The device of Claim 11 wherein said sponge is formed of a material selected from the group of materials consisting of:

gel foam;
collagen;
polymeric foam material;
textile material; and,
woven fabric.

13. The device of Claim 1 wherein said lumen blocking portion is a disc.

14. The device of Claim 1 wherein said lumen blocking portion is a woven fabric member.

15. The device of Claim 1 wherein said lumen blocking portion is formed at least partially of a material which is capable of being penetrated by a transluminally advanceable penetrating member, after the device has been implanted in a blood vessel lumen.

16. The device of Claim 1 wherein the blood vessel engaging portion of the device is radially contractible following implantation so as to disengage from the blood vessel wall, thereby facilitating removal of the device.

17. The device of Claim 16 wherein said device further comprises a connector formed on the device to facilitate connection of the device to a transluminally inserted retrieval instrument which is operative to pull the device in to an adjacent catheter.

18. The device of Claim 17 wherein the blood vessel engaging portion of the device is constructed such that, when the retrieval instrument is attached to the connector and a pulling force is applied to the retrieval instrument, the blood vessel engaging portion of the device will be thereby caused to radially contract and disengage the blood vessel wall, thereby facilitating retraction of the device into the adjacent catheter.

19. The device of Claim 1 wherein said blood vessel engaging portion is formed of a shape memory material which transitions to said operative configuration when warmed to body temperature, but which may be radially contracted *in situ* by bathing the device in a cooled liquid so as to cool the device to a shape memory transition temperature which is lower than body temperature.

20. The device of Claim 1 wherein said blood vessel engaging portion is formed of resilient self-expanding material which is biased to said operative configuration such that, when unconstrained, said device will resiliently self-expand to said operative configuration.

21. The device of Claim 1 wherein said blood vessel engaging portion is formed of a plastically deformable material which is initially of said radially compact configuration, but which is subsequently deformable to said operative configuration by the application of pressure against said device.

22. The device of Claim 1 wherein:

a) said blood vessel engaging portion comprises a frame which is generally cylindrical when in its radially compact configuration, said frame having first and second opposed ends, said frame being capable of assuming a generally frusto-conical shape which conforms to the shape of a tapered blood vessel wall, when the frame is expanded to its operative configuration and in engagement with said vessel wall; and,

b) said lumen blocking portion comprises a pliable seal which is mounted on said frame, said seal being configured and positioned to form a transverse barrier within said blood vessel lumen when said frame is expanded to its operative configuration and in engagement with said vessel wall.

23. The device of Claim 22 wherein said cylindrical frame is fabricated from a shape memory material which has said collapsed configuration when at room temperature and which transitions to said operative configuration when warmed to body temperature.

24. The device of Claim 22 wherein said cylindrical frame has a plurality of projections formed thereon to embed within the blood vessel wall.

25. The device of Claim 24 wherein said frame is formed of wire members and wherein said projections comprise bends formed in said wire members.

26. The device of Claim 22 wherein said pliable seal is formed upon said first end of said cylindrical frame and is positioned relative to the direction of blood flow through the blood vessel lumen, such that the exertion of normal blood pressure against said seal will urge the second end of said cylindrical frame to further expand, thereby increasing the pressure exerted by the second end of said frame against the blood vessel wall.

27. The device of Claim 26 wherein the second end of said cylindrical frame flares outwardly such that,

when in its operative configuration, said second end will conform to and engage the lumen of a tapered segment of blood vessel.

28. The device of Claim 22 wherein said seal is an elastomeric membrane having a porous fabric mounted thereon.

29. The device of Claim 22 wherein said cylindrical structure comprises a radiographically visible material.

30. The device of Claim 22 wherein:

a) said cylindrical frame comprises a plurality of longitudinally extending wires collectively connected at a respective end thereof; and

b) said seal is formed about said first end of said cylindrical structure such that said longitudinally extending wires extend from one side thereof.

31. The device of Claim 30 wherein said seal is oriented on said frame relative to the direction of blood flow such that the hemodynamic pressure on said seal will urge said longitudinally extending wires to embed within said lumen of said vessel.

32. The device of Claim 22 wherein:

a) said cylindrical frame comprises elongate members formed in a generally sinusoidal configuration; and

b) said elastomeric seal entirely covers said frame.

33. The device of Claim 32 wherein said elongate members are formed in a zig-zag configuration with the apices of said zig-zag being located at the first and second ends of said cylindrical frame.

34. The device of Claim 21 wherein vessel engaging portion is a frame having a longitudinal axis, said frame being formed of a plurality of elongate wire members, each such wire member having first and second ends, said

wire members being arranged about and parallel to said longitudinal axis, the first and second ends of said members being coterminous and collectively connected to form the ends of said frame, and said wire members being bowed radially outward from said longitudinal axis, such that said frame has a generally bulbous shape.

35. The device of Claim 34 wherein said ends of said frame are axially inverted within said frame.

36. The device of Claim 34 wherein the midsection of the frame is radially compressed to cause said frame to have a radially indented mid-portion between first and second bulbous portions.

37. The device of Claim 1 wherein:

a) said vessel engaging portion comprises a conical frame ; and,

b) said lumen blocking portion comprises a pliable covering formed upon said frame.

38. The device of Claim 37 wherein said conical frame comprises a plurality of elongate wire members having first ends and second ends, the first ends of said wire members being convergent and collectively connected to form one end of the frame, the second ends of said wire members being unconnected and outwardly biased such that when said frame is expanded to its operative configuration, the second ends of said wire members will project radially outward and will engage the blood vessel wall.

39. The device of Claim 38 wherein said frame has a catch ring formed thereon to enable said device to be selectively removed from where such device is seated.

40. The device of Claim 1 wherein:

a) the blood vessel engaging portion comprises at least two self-expanding wire structures having bends formed at substantially the respective midpoints thereof, said at least two self-expanding wire structures being formed to intersect at said bends formed at the midpoints

thereof, said wire structures being designed and configured to assume a first compressed configuration for deployment through a catheter, and a second expanded configuration for radially compressing against and adhering to said lumen of said blood vessel; and

b) said lumen blocking portion comprises a microporous membrane formed about said intersecting wire structures, said membrane being formed about said intersecting wire such that when said intersecting wires assume said second expanded configuration, a cup-like structure is formed.

41. The device of Claim 40 wherein said microporous membrane is designed and configured to facilitate the formation of a blood clot when said device is deployed within said lumen of said blood vessel.

42. The device of Claim 40 wherein said device further includes a catch ring formed upon said intersection of said wire structures, said catch ring being designed and configured to allow said device to be removed from its seated position within said lumen of said blood vessel.

43. The device of Claim 1 wherein said device comprises an annular spring disk having a plurality of elongate, inwardly-biased members extending thereabout, said inwardly-biased elongate members having a pliable fabric formed thereover such that a conical-like structure is formed, said device being designed and configured to be oriented such that said conical structure is positioned in the direction of blood flow to be occluded.

44. The device of Claim 43 wherein said annular spring is designed to radially compress against and firmly seat said device within said lumen of said blood vessel.

45. The device of Claim 44 wherein said conical-like structure has an aperture formed at the distal-most tip thereof, said aperture being designed and configured to assume a first closed position and a second open position, said second open position being assumable when a force is axially exerted through said device through the side opposite the occluded blood flow.

46. The device of Claim 1 wherein said device comprises an annular spring having a pliable membrane formed thereabout, said annular spring being outwardly biased such that when said device is deployed within the lumen of a vessel, said annular spring imparts a radially compressive force about said lumen of said vessel.

47. The device of Claim 46 wherein said annular outer spring is comprised of heat expandable material that causes said spring to expand radially when heated to body temperature such that when said device is deployed within the lumen of a vessel, said annular spring expands radially to compress against said lumen of said vessel.

48. The device of Claim 46 wherein said membrane may be selectively penetrated.

49. The device of Claim 1 wherein said device comprises:

a) a helical coil being sized and adapted to be axially positioned within said lumen of said vessel, said helical coil being designed to assume a first compressed configuration for deployment through said lumen at said catheter, and a second expanded configuration for radially compressing against said lumen of said vessel when said device is selectively positioned therein; and

b) an elastomeric bag covering said helical coil, said elastomeric bag being designed and configured to stretch about the opposed ends of said helical coil such that a vaso-occlusive barrier is formed.

50. The device of Claim 49 wherein said elastomeric bag may be selectively penetrated such that when said helical coil of said device is axially positioned within said lumen, there is defined a retransversible axial pathway at said specified site where said blood flow is occluded.

51. The device of Claim 1 wherein said device comprises a hard cap of non-distensible material coupled with an inflatable occluder, said hard cap and occluder being sized and adapted to be deployed through said lumen of said catheter when said occluder is maintained in an uninflated state, said occluder being so inflatable that when said device is deployed at said specified site, said occluder radially expands and compresses against said lumen of said vessel such that said device becomes firmly seated thereat.

52. The device of Claim 3 wherein aid occluder is formed to have a fixed surface area and is designed to be oriented in the direction of blood flow to be occluded such that when said occluder is deployed and contacted with a compressive force of blood flow, said occluder imparts a further radially-compressive force about said lumen at said specified site.

53. The device of Claim 1 wherein:

a) said blood vessel engaging portion comprises a cylindrical wire matrix designed to assume a first diametrically compressed configuration and a second diametrically expanded configuration, said matrix being deployable through said lumen of said catheter when maintained in said first compressed configuration, said matrix being rigidly positionable within said lumen of said vessel when maintained in said second expanded configuration; and

b) said lumen blocking portion comprises a sock for occluding blood flow formed axially about a respective end of said matrix, said sock being so

connected to said matrix such that when said device is deployed within the lumen of a vessel such that said sock is oriented in the direction of blood flow, said sock axially inverts within said matrix causing said matrix to assume said second expanded configuration.

54. The device of Claim 53 wherein said sock may be selectively penetrated such that said device forms a retransversible axial pathway at said specified site where said blood flow is occluded.

55. The device of Claim 1 wherein said device comprises a central mass of mesh wire having a plurality of projections radially-extending thereabout, said protrusions being designed and oriented to radially embed within said lumen of said vessel such that said device remains firmly seated at said specified site where said blood flow is occluded.

56. The device of Claim 55 wherein said wire mesh is designed and configured to promote the formation of a clot about said device such that a vaso-occlusive mass is formed about said device.

57. The device of Claim 55 wherein said protrusions comprise hooks oriented to embed within said lumen of said blood vessel.

58. The device of Claim 55 wherein said device is fabricated from shape memory material such that said device assumes a first compressed configuration for deployment through a catheter when subjected to a first reduced temperature, and assumes a second expanded configuration for radially compressing against and adhering to said lumen of said blood vessel when subjected to a second increased temperature.

59. The device of Claim 1 wherein said device comprises a spherical coil contained within an elastomeric covering, said spherical coil being designed to assume a first compressed configuration and a second expanded configuration such that when said device is

maintained in said compressed condition, said device is deployable through said lumen of said catheter and when maintained in said expanded configuration, may radially expand and compress about said lumen of said catheter such that said device remains rigidly seated at said specified site where said blood flow is occluded.

60. The device of Claim 59 wherein said spherical coil is comprised of heat-expandable material such that when exposed to a first reduced temperature, said spherical coil assumes said first compressed configuration, and when exposed to a second increased temperature assumes said second expanded configuration.

61. The device of Claim 59 wherein said spherical coil has a plurality of elongate protrusions radially-extending through said elastomeric covering, said protrusions being designed and configured to embed within said lumen of said blood vessel to rigidly seat such device at said specified site where said blood flow is occluded.

62. The device of Claim 1 wherein said blood vessel engaging portion comprises a cylindrical tubular structure having a midsection and first and second opposed ends, said first and second opposed ends having a diameter greater than the diameter of said midsection, and said lumen blocking portion comprises first and second elastomeric seals formed on the first and second ends of said midsection, such that when said device is axially positioned within the lumen of said blood vessel said elastomeric seals produce vaso-occlusive barriers, said first and second opposed ends being designed and configured to radially compress against said lumen of said vessel such that said device remains rigidly seated at said specified site where said blood flow is occluded.

63. The device of Claim 61 wherein said cylindrical tubular structure is comprised of a plurality of struts held coupled at the respective midpoints thereof, said struts being so coupled at their midpoint

such that the respective ends of said struts are biased to radially splay out to thus compress against said lumen of said vessel.

64. The device of Claim 63 wherein said struts are so coupled at their respective midpoints such that said cylindrical structure may assume a first collapsed configuration whereby the diameter of the first and second opposed ends may be decreased such that said device may be deployed and retrieved through a lumen of a catheter.

65. The device of Claim 64 wherein said cylindrical tubular structure assumes said first collapsed position by aligning said struts in generally parallel relation to one another.

66. The device of Claim 1 wherein said device comprises an inner core contained within an outer coating, said inner core being designed to selectively assume a first compressed configuration and a second expanded configuration wherein said device is maintained in said first compressed configuration said device may be deployed through a lumen of a catheter and when said device assumes said second expanded configuration, said device expands to radially compress and become rigidly seated at said specified site.

67. The device of Claim 66 wherein said outer coating is fabricated from a material having a smooth outer surface that is resistant to in-growth and prevents blood from clotting thereabout.

68. The device of Claim 1 wherein said device comprises a balloon filled with heat expandable material such that said balloon may selectively assume a first collapsed configuration and a second expanded configuration, said balloon being deployable through said lumen of said catheter when said heat expandable material assumes said first collapsed configuration, said balloon radially expanding within said lumen of said blood vessel to form a vaso-occlusive mass and remain rigidly seated

at said specified site when maintained in said second expanded configuration.

69. The device as recited in Claim 68 wherein said device assumes said first collapsed position when subjected to a first reduced temperature, said balloon assuming said second expanded configuration when subjected to a second increased temperature.

70. The device as recited in Claim 69 wherein said device assumes said second expanded configuration when warmed to body temperature.

71. The device as recited in Claim 68 wherein said balloon is fabricated from a pliable material having a smooth outer surface that is resistant to ingrowth and prevents blood from clotting thereabout.

72. The device as recited in Claim 1 wherein said device comprises:

a) first and second balloon catheters selectively positionable along a segment of lumen of a blood vessel, said first and second balloons being inflatable such that blood flowing through said segment is occluded; and

b) a central lumen disposed between said first and second balloon catheters, said central lumen having a plurality of apertures formed thereon for infusing embolization means therethrough, said embolization means forming a vaso-occlusive barrier about said lumen of said vessel.

73. The device of Claim 72 wherein said first and second balloons are positionable along a section of lumen having at least one side branch vessel extending therefrom, said lumen disposed between said first and second balloon catheters being designed and configured to infuse embolization means to occlude blood flow through said at least one offshoot vessel.

74. The device as recited in Claim 72 wherein said contrast media may be infused through said apertures of said lumen disposed intermediate said first and second

catheter balloons prior to infusing said embolization means so that said offshoot vessels may be defined.

75. The device of Claim 1 wherein said device comprises a three-valved stent selectively positionable within a section of lumen of a vessel having at least one offshoot vessel extending therefrom, said stent being so positionable that blood flow through said vessel and said at least one offshoot vessel extending therefrom may be selectively controlled, said stent being designed and configured to assume a compressed configuration such that said stent may be deployed through the lumen of a catheter, said stent being designed to assume a second expanded configuration such that when positioned within said section of lumen, said stent imparts an axial force about said lumen such that said stent remains rigidly seated at said specified site.

76. The device of Claim 1 wherein said device comprises a chemical agent that, when deployed from said catheter, adheres to said lumen of said blood vessel and congeals to form a vaso-occlusive mass.

77. The device of Claim 76 wherein such device comprises an agent consisting of a clot inducing substance that adheres to said lumen and forms a blood clot thereabout, said blood clot becoming fused with said agent such that a vaso-occlusive mass is formed.

78. A device for closing the lumen of a blood vessel, said device comprising:

an elongate probe member having a distal end;

means for collapsing the blood vessel wall at a location adjacent the distal end of the probe;

a vessel wall fusing means for fusing the blood vessel wall;

said probe being insertable into a blood vessel at a location where it is desired to seal the lumen of the blood vessel, said means for collapsing the blood vessel wall being then useable to collapse a portion of the blood vessel adjacent the distal end

of the probe, said vessel wall fusing means being then useable to fuse the blood vessel wall in the collapsed area, thereby closing the blood vessel lumen.

79. The device of Claim 78 wherein said means for collapsing the blood vessel wall is a suction lumen which extends longitudinally through the probe and which terminates in at least one suction port, such that suction may be applied to the blood vessel lumen adjacent the distal end of the probe to cause the blood vessel to collapse at that location.

80. The device of Claim 78 wherein said means for collapsing the blood vessel wall is a device which is connectible to the blood vessel wall and which is useable to force the blood vessel wall to a collapsed configuration.

81. The device of Claim 78 wherein said vessel wall fusing means is a lumen through which an adhesive may be passed, said lumen terminating in an adhesive outlet port, such that adhesive may be infused through the probe to seal the blood vessel lumen in the area wherein the blood vessel wall is collapsed.

82. The device of Claim 78 wherein said blood vessel wall fusing means is an energy emitting member formed on the probe and operable to emit energy to seal the blood vessel lumen in the area wherein the blood vessel wall is collapsed.

83. The device of Claim 82 wherein said energy emitting member is an electrode.

84. The device of Claim 83 wherein said electrode is monopolar electrode.

85. The device of Claim 83 wherein said electrode is bipolar electrode.

86. The device of Claim 79 wherein said device further
comprises:

an inflatable balloon mounted on said probe at a location proximal to said least one suction port and said at least one energy emitting member, said balloon being configured such that when inflated said balloon will substantially occlude the lumen of the blood vessel and will prevent blood flow therethrough.

87. A device for closing the lumen of a blood vessel, said device comprising:

an elongate transluminally insertable probe having a detachable core member mounted on the distal end thereof and an energy-transmitting pathway extending longitudinally through the probe, said probe being insertable into the lumen of a blood vessel such that the core member is located at the site at which it is desired to close the blood vessel lumen, energy being subsequently passable through the probe member to cause the blood vessel wall to constrict about and engage the core member, thereby closing the lumen of the blood vessel, said core member being thereafter detachable from said probe member such that the probe member may be extracted and removed from the body leaving the core member implanted within the constricted region of the blood vessel.

88. A device for sealing the lumen of a blood vessel, said device comprising:

an elongate catheter having a hollow lumen extending longitudinally therethrough and terminating in a distal opening;

an energy-delivering member which is advanceable out of the distal opening of the catheter;

said catheter being advanceable through a blood vessel to a location at which the distal end of the catheter is adjacent the site at which the blood vessel is to be closed, a quantity of non-

proteinaceous, energy-transmitting fluid being infusible through the lumen of the catheter so as to fill the lumen of the blood vessel adjacent the distal end of the catheter, said energy transmitting member being advanceable out of the opening of the catheter and into the energy-transmitting fluid such that energy delivered from the energy delivering member will be transmitted by the energy transmitting fluid to the surrounding wall of the blood vessel, thereby causing the blood vessel to constrict and close at that location.